The International Society for Ecological Psychology

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Welcome to another newsletter --- finally. Thanks to all the contributors who got their material in on time, then waited patiently until I (Bill Mace) finally put it all together. Ecological psychologists have been very busy this year and the delay of the newsletter is a symptom of this ecological activity.

What you'll see here is not nearly all that could be reported. Please feel free to submit news that you think other readers would find useful, interesting, or amusing.

Meeting Reports

One major function of this newsletter is to give people notice of meetings coming up and to report on meetings that have been held since the last newsletter. The ones mentioned in this issue will be ---

ICEPA6 (Amsterdam, August 25-30, 1991)
ISEP--UK (U. of Manchester, September 23-24,1991)
ISEP Annual Meeting (Hartford, October 19, 1991)
Dutch Society for Eco. Psy (Delft, November 8, 1991)
German Speaking ISEP (December 14, 1991)
ISEP spring meeting (Seton Hall U., May 23, 1992)
European ISEP (Glasgow, June 24 - 26, 1992)
ISEP Annual Meeting (F & M, October 17, 1992)
ICEPA7 (Vancouver, B.C. August 8-13, 1993)

International Conference on Event Perception and Action (ICEPA6)

Amsterdam
August 25-30, 1991

As John Pittenger now has discovered, the organizers of the Amsterdam conference worked so hard for so long that they will be a very tough act to follow. Peter Beek, Reinoud Bootsma, Martha Reijmers, Piet van Wieringen, (in alphabetical order), and innumerable colleagues and students made the week a memorable one for all who were lucky enough to attend. We were surrounded by evidence of the drawing talent of P. J. Stappers of Delft. He designed the official conference T-Shirt and had original ecological psychology cartoons throughout the *Proceedings* book.

There were 15 symposia and nearly 100 posters. The Symposium topics were: "Evolution and Action," Ecological Realism," "Event Cognition", "Multiple Specification of Ecological Information?", "Picture Perception," "Motion Perception," "Optic Flow and Locomotion," "Perception - Action Compatibility," "Human Factors," "Synergetic Approach to Pattern Generation and Pattern Recognition," "Speech Production and Speech Perception," "Adaptability in Natural Measurement, Representation, and Effector Systems," "Exploratory Activity: Constraints and Opportunities," "Social Affordances," and "Ball Skills." This last symposium, organized by Peter Beek and Reinoud Bootsma, honored John Whiting, the retiring Professor of the Faculty of Human Movement Sciences program that hosted the meeting.

An addition to the format of past meetings was an explicit discussion session related to the Poster presentations. Posters had been arranged in several topic categories. All presenters in a given category met in a classroom together with whatever people wanted to discuss the common topic. The discussion groups all met at the same time. Anyone with constructive suggestions and opinions about the value of these discussion opportunities should send comments to John Pittenger (who will figure prominently in our Vancouver report later in this newsletter).

Abstracts of talks in symposia are printed in the conference *Proceedings*, and the Poster presentations were collected in an extraordinary *Poster Book*. These, especially the poster book (which contains data), have proven to be valuable resources worth repeated consulting. Fortunately, through the foresight and resources available to the organizers, this material continues to be available to anyone who wants it.

All talks were professionally tape recorded by Audio Archives International. There are at least 27 possible cassettes that can be ordered. At the conference, the cost of a complete set was advertised at 230 NFl. Subsets were 50 to 57 NFl. I do not know the current prices, but these surely can be tracked down through our friends in Amsterdam.

The posterbook can be ordered from someone (e.g. Peter Beek, Claire Michaels, Martha Reijmers, or Piet van Wieringen for starters) at the Free University by sending a credit card number. The price for the book is DFl 40,-, and an additional DFl 5,- for postal charges. The Free University address to use is (presuming that you address your request to a specific person): Faculty of Human Movement Sciences, Free University, Van der Boechorststraat 9, 1081 BT Amsterdam, The Netherlands.

Workshop on Situated Action
(Organized by UK Members)

University of Manchester
England
23-24 September 1991

Report by Ivan Leudar and Alan Costall

The term 'situated action' has been adopted by the cognitive sciences to stress that activities are determined by more than abstracted rules and representations. Our reason for organizing this meeting was to develop a coherent ecological approach to situated action through reference to a wide range of concrete examples, and, in the process, combine the resources of several different disciplines: psychology, microsociology, economics, architecture, philosophy, archaeology and social anthropology. All the participants have previously worked on some aspects of human action, but these varied widely, from the role of planning in the regulation of macro-economic behaviours to the development of intentional activities in children. The spring-board topics were the nature of individual/environment dualism, coordination in joint activities and the problem of their intentionality, and the relationship between agency and subjectivity in social activities.

As it happened, an important issue proved to be the situating of 'situationism' itself. For, although the emphasis upon the situatedness of action has provided a highly important argument against cognitivism, is it possible to go beyond critical reaction? Can a positive, alternative programme be developed? And, in any case, may not cognitivism still have its place, at least in relation to our dealings with artificial, formal systems?

In the event the discussions homed on some recurring problems. These were the problem of coordination, planning, units of analysis and intentionality. Different aspects of the coordination problem were addressed from the fields of conversation analysis, macro-economic activities, work and work environment design. It became clear that coordination evolves in groups, individual's activities becoming coordinated without face-to-face contact. Coordination can also be a matter of designing environments which enable and constrain human activities. Planning is itself a means of coordination. We analysed conceptualizations of planning in economics, urban development, microsociology, work psychology and cognitive science and we concluded that situated accounts of action cannot neglect human ability to plan, but that the planning should not be seen as a solipsist, cognitive process. It must be formulated as a social process, involving power, control, socially situated and a significant resource for coordination.

A number of papers addressed the question of 'units of analysis', drawing critically upon Vygotsky, Merleau - Ponty, and Husserl. For if the classical, analytical approaches encounter the problem of 'context', then holistic approaches face their own problem of analysis. Indeed, the issue of units returned us to the wider discussion of the prospects for situationism. Should we even think in terms of fixed units as in traditional sciences? In a similar way, papers on the phenomenological treatment of intentionality, and on the origins of intentionality in infancy emphasized the embodied nature of intentionality, and thus complemented our earlier discussions of intentionality in relation to plans.

This summary has attempted to identify some the themes that arose during this lively meeting. Abstracts of the 21 contributions can be obtained from:

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or

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Papers:

Marino Bonaiuto & Mirellei Bonnes, Department of Psychology, University of Rome. "Situated actions and place theory: An "eco-psychological" framework."

Alan Costall, Psychology Department, University of Southampton "Desituating action: developmental theory as a 'bootstrap' for cognitivism."

Pat Devine, Department of Economics, University of Manchester "Economists' models of coordination in social activities."

Gwyneth Doherty, Department of Psychology, University of Glasgow, Glasgow. "Conversational games in dialogue."

Simon Garrod, Human Communication Research Center,University of Glasgow. "Dyadic language co-ordination as a basis for establishing group meaning."

Jim Good & Charles Crook, Psychology Department, University of Durham. "Situating the 'socio-cultural' approach and Gibsonian ecological psychology - or - How to take culture seriously without appearing to lose touch with reality."

Paul Graves, Department of Archaeology, University of Southampton. "The fundamental conceit of the flint knapper."

Peter Heij, Faculty of Human Movement Studies, Free University, Amsterdam "Embodied Intentionality - The Significance of Merleau - Ponty's Intentional Embodiment for the Foundations of Gibson's Ecological Psychology."

Tim Ingold, Department of Anthropology, University of Manchester "Against cultural psychology."

Ivan Leudar, Department of Psychology, University of Manchester. "Coordination in joint activities."

Stephen MacKeith, Department of Psychology, University of Southampton. "Imagination."

Ullin Place, Psychology Department, University of Wales, Bangor. "Contingency Analysis applied to the Pragmatics and Semantics of Naturally Occurring Verbal Interactions."

John Pickering, Department of Psychology, Warwick University. "Artificial and natural situations."

Peter Pufall, Department of Psychology, Smith College. "Children's representations of actions."

Vasudevi Reddy, Department of Psychology, Portsmouth Polytechnic. "The early understanding of intentions."

Gustavo Ribeiro, Department of Architecture, Huddersfield Polytechnic, HD1 3DH. "Urban events."

Wes Sharrock, Sociology Department, University of Manchester. "Situated in setting."

Robert Shaw, Department of Psychology, University of Connecticut. "Intention as a coordinating tendency in actions situations."

Arthur Still, Psychology Department, University of Durham. "Unsituated action: Kinaesthesis and the surrounding world of life."

Benny Shanon, Psychology Department, Hebrew University Jerusalem. "Units in psychological explanation."

David Wastell, Department of Computer Science, University of Manchester. "Coordination and Cooperation in ICL Customer Services."

Dieter Zapf, Psychology Department, University of Giessen, Germany. "Activity Theory in Germany."

ISEP Annual Meeting

Trinity College
Hartford, CT USA
October 19, 1991

Business -- The current Board of Directors of the ISEP appears below, divided into two groups, those elected at the 1990 Annual Meeting in the first column, and those most recently elected (the 1991 meeting) in the second. Because of expected changes in the time of our business meetings (at the biennial ICEPA's) and terms of office (4 years instead of 2), the exact terms of the current Board members are not quite official. The exact wording of changes and their interpretation will be sent to the Board later this summer and then presented to all members for an official vote.

Next Terms to Expire	Last Elected
Bootsma	Flach
Costall	Fowler
Gibson	Guski
Jenkins	Mace
A. D. Pick	Michaels
Runeson	Mingolla
Thelen	Shaw
	W. Warren

Pleasure -- There were seven talks during the day: "Treasure in the attic: The impact of the Webers' 1836 study of human locomotion on the development of mathematical physics" (Mary M. Flesher, Smith College), "Becoming a mover and a shaker during infancy" (Gene Goldfield, Connecticut College), "Impedance Matching: Why babies bounce the way they do?" (Bruce Kay, Brown University), "Optical modulation of balance during walking" (Bill Warren, Brown University), "Neural network bases for veridical realization of motor intentions" (Dan Bullock, Boston University, Adaptive Systems), "Perceiving and representing what is reachable for self and for others in 3 - to 6 - year old children" (Philippe Rochat, Emory University), and "Size perception in events" (Michael Muchisky and Geoff Bingham, Indiana University). Abstracts of some of these are later in this newsletter.

Jackie Gibson brought with her a copy of her new book, *An Odyssey in Learning and Perception*, that she donated as a prize for the best poster in the afternoon poster session. In an impromptu balloting of those present, Tony Morris of the University of Connecticut, was chosen to receive the prize. Tony was first author on a detailed study of the Necker cube illusion. Write to Tony or wait for subsequent publications to find out what this has to do with ecological psychology.

As has always been the case with out meetings, all talks, most discussion, and even some of the business meeting are available on audio tape.

Dutch ISEP
Perception and Technology

Laboratory for Form Theory
Faculty of Industrial Design Engineering
Delft University of Technology

November 8, 1991

C. J. Overbeeke and A. C. M. Blankendaal put together a fascinating day of 8 talks: "Ecological approaches to visuomotor organization" (P. R. Green, University of Nottingham), "Auditory icons and technology affordances: Examples of an ecological approach to design" (Bill Gaver, Rank Xerox, Cambridge, UK), "Situated design: Reciprocal evolution of work practice and product development" (J. F. Gerrissen & R. de Vogel, Philips Research, Eindhoven), "Tool use in infancy: Perception of higher order affordances" (L. van Leeuwen & A. Smitsman, Nijmegen), "Active exploration and 3D shape perception" (W. van Damme, Neuro-ethology group, Utrecht), "Looking for place-of-contact information in a parabolic flight trajectory" (T. van Santwood, Free University), "The dynamics of posture and vision: An action - perception model" (T. Dijkstra, G. Schöner, S. Gielen, E. Argantel & M. Giese, Nijmegen and Ruhr-Universität of Bochum), and "Scaling the visual consequences of active head movements" (P. J. Stappers, Delft).

There is a smartly designed pamphlet containing abstracts of these presentations which might be available from one of the organizers. It's definitely worth inquiring.

German Speaking ISEP

December 14, 1991

The annual meeting of the German speaking section of the ISEP was held on December 14. It was organized as a pure discussion meeting concentrating on the topic, "Multiple sources of information."

ISEP U.S. Spring Meeting

Seton Hall University
May 23, 1992

As most of you know, there was a spring meeting hosted by Greg Burton at Seton Hall University in South Orange, NJ. We were treated to 7 talks and 11 posters, then happened on to a perfect Irish pub / restaurant near the Seton Hall campus for dinner and evening relaxation.

Here goes -- another list of talks. "Preliminaries to an ecological theory of human language capacity" (Jeffrey Kinsella-Shaw, Haskins Laboratories), "Comments on Kinsella-Shaw's paper" (Mary R. Smith, Bellcore), "Dynamic duals: Applying intentional dynamics to hemodynamic display designs" (Judy Effken, CESPA, U. of Connecticut), "Ecological psychology in the service of ecological science: Human factors of remote sensing" (Robert Hoffman, Adelphi University), "The anchoring problem in surface lightness perception" (Alan Gilchrist, Rutgers University), "Perceiving surface layout by attachments to the skin" (Dragana Barac-Cikoja, CESPA, U. of Connecticut), "A dynamic pattern approach to understanding the coordination of manual squat lifting" (John Scholz, U. of Delaware).

Second European Conference on Ecological Psychology

June 24 - 26, 1992
University of Strathclyde
Glasgow, Scotland

A very full program has been arranged by Jimmie Thomson and colleagues, especially John Pickering. Symposium topics and their organizers are: Evolution and ecological relations (John Pickering, Warwick University), Material culture and cognition (Alan Costall, Southampton University), Stability -- symmetry and constraints in two - effector systems (Peter Beek, Free U. Amsterdam, Yves Guiard, CNRS Marseille), Ecological acoustics (Rainer Guski and Wolf Heine, Ruhr-Universität, Bochum), Locomotion and spatial orientation Jimmie Thomson, Strathclyde), Task specific demands of coordinated movement patterns (Walter Rikkert and Geert Savelsbergh, Free U.), and Disorders of movement (Patrick Haggard, Oxford).

1992 ISEP Annual Meeting

Problems and Prospects for Interdisciplinary Teaching in Psychology

October 16 - 17, 1992
Whitely Psychology Laboratories
Franklin & Marshall College
Lancaster, PA

Ecological Psychology is in the forefront of interdisciplinary research in psychology. When teaching ecological psychology we all experience problems in preparedness (our own as well as students'!) resulting from this interdisciplinary emphasis. Proper training in Ecological Psychology surely involves an integration of psychology with work in mathematics, the natural sciences, and certain aspects of the social sciences that dictates greater breadth than psychology departments usually provide. The purpose of this meeting is to discuss how to improve the interdisciplinary training of students for Ecological psychology. We hope to enable ISEP members and other interested parties to learn about existing and proposed curricular initiatives, course ideas, novel laboratory exercises, and software packages.

Organization of The Meeting

Over the course of the two days, we hope to engage in a number of different kinds of activities. The core of the meeting will be a series of talks on Friday and Saturday afternoon in which invited speakers will outline curricular projects or courses they have developed and review problems they have encountered. Saturday morning will be devoted to demonstrations of software and other novel laboratory exercises (to take place in the Whitely labs, along with the Posters reviewing new empirical work). The conference will kick off with a Plenary Lecture by Ulric Neisser

focusing on the kinds of Psychology-Humanities integration his work on the Nature of the Self requires. The conference will conclude with a round-table discussion in which several invited "critics" will try to sum up the various ideas and lessons of the two days. So far, Tim Johnston and Herb Pick have agreed to act as "critics."

Call for Demonstrations!

Have you developed a neat lab exercise, or a nice video display, or perhaps even some software for students to work with? We would love to give you a chance to show off. We will make every effort to have computer, video, and other facilities available you.

What about Data Talks?

We have decided not to have any empirical talks, but we will still have a full-scale poster session, as usual.

Other Activities

These are still being cooked up. But they are likely to include a wine tasting / perceptual learning experiment conducted by Jack Heller, resident oenologist, and a visit to someplace Amish for eating. We will probably not be able to visit Pottsville (2 hours away), where the Yuengling brewery is still the oldest in continous operation in the US, bu we might sample some of their wares.

ICEPA 7

University of British Columbia Conference Centre
Vancouver, B.C., Canada
August 8-13, 1993.

John Pittenger, Chair of the Organizing Committee reported at our Seton Hall meeting in May. Most of the symposium slots have been filled, although there is room for a few more. If anyone has a burning desire or brilliant idea for a topic and group of participants, contact John as soon as possible.

Soon, registration fees will be set, the symposia will be determined, and a general call for papers and posters in those categories will go out.

VOLUNTEERS WANTED

John made it very clear that whether or not we can have a poster book to rival the one produced for the Amsterdam meeting will depend on getting some volunteer help. Putting text and figures into a uniform format for a very large book is a very large job. If you can volunteer to help John on this or any of a number of other chores, please contact him soon.

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Meeting Abstracts

1991 Annual Meeting, Hartford, CT

Impedance matching: Why babies bounce the way they do?

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That great movement researcher whom we always pay homage to somewhere in a talk on action, Bernstein, made the point that an organism cooperates with its own properties in order to produce efficient goal-oriented movements (rather than trying to fight those properties). In tasks in which the organism forcefully interacts with an environment, the organism must also cooperate with the properties of that environment to produce efficient movements. In my talk I discussed the notion of impedance as being a useful tool in studying such movements, and in particular, in trying to understand how babies learn to bounce efficiently in a Jolly-Jumper spring apparatus, as studied in experiments performed by Gene Goldfield.

Impedance is defined as the overall opposition a system produces in response to motions or forces imposed upon it by some other system. The organism and the environment each have their own impedance, with respect to what the other is doing to it. The organism can vary its impedance, to choose the best impedance to go with the environment's impedance. How does the organism select the "right" impedance? In a task in which the forceful interaction is significant, there is energy flowing from the organism to the environment and vice versa. The organism probably tries to optimize this energy flow, since it has only so much energy to do its daily tasks.

The particular desirable energy optimization depends upon the task. Let's assume that in the baby bouncing task, in which a baby is attached to a spring which is attached to the ceiling, that the baby is trying to bounce as much as possible for as little energetic cost as possible. In that case, it's trying to transfer as much energy from its onboard energy source--its muscles--to its own mass (with an attached spring). A basic engineering theorem states that the maximum power transfer from the muscles to the baby-mass-spring occurs when the impedances of the two match (are equal). Thus the baby must learn to match its stiffness to the stiffness of the attached spring. This added stiffness predicts the frequencies at which the babies chose to bounce, much better than other simpler mass-spring models of the situation.

Finally, I raised the point that impedance matching criteria differ for different task domains. In tasks where energetic flow is not important, but where low-energy informational transfer dominates, there actually must be a gross inequality in impedance for things to work.

Neural Network Bases for Veridical Realization of Motor Intentions

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A major theme in the history of psychology has been the study of perceptual invariants, and much work in ecological psychology has concerned the classes of invariant information that specify environmental affordances. A dual concern, less well represented heretofore within ecological psychology, is how adaptive systems evolve so as to exhibit a relatively invariant ability to register important classes of invariant information. It does not follow from the availability of information that an animal exists which can be sensitive to it and remain sensitive to it under a wide range of circumstances. It can be shown that a sophisticated nervous system design is often needed to constitute a robust ability to separately register information which -- while invariantly available in the ambient energy array -- may be combined in that array with other information, or may be defined over energy distributions that exhibit very large total-energy fluctuations under natural conditions, e.g., during the day-night cycle. Recent studies in neural networks have begun to discover how to specify dynamical systems capable of exhibiting the requisite robust sensitivities. Another neglected dual to the traditional concern with veridical perception is a concern with veridical realization of motor intentions. Just as different kinds of information may be combined in an ambient optic array, and may complicate the design of a perceptual system, so different kinds of information may be combined in the specification of a motor intention. For example, many acts critical to human cultural practice require specification of both skeletal configurations and the stiffnesses with which skeletal segments interact with each other and the remainder of the world. In this presentation, we argue that many of the complexities of spinal neural circuitry are necessary to ensure near-invariant realization of motor intentions (skeletal configuration + stiffness specifications) when descending signals of two basic types independently vary over large ranges of magnitude and rate of change. Because these two types of signal afford independent control, or Factorization, of muscle LEngth and TEnsion, our initial construction was named the FLETE model (Bullock & Grossberg, 1988). This paper extends that model and offers a rational, step-by step reconstruction of many aspects of the mammalian neural circuitry known to be involved in the spinal cord's regulation of opposing muscles acting on skeletal segments. Mathematical analyses and local circuit simulations based on neural membrane equations are used to clarify the behavioral functions of five fundamental cell types, their complex connectivities, and their physiological actions. The cell types are: alpha-motoneurons, gamma-motoneurons, Ia-interneurons, Ib-interneurons, and Renshaw cells.

References

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Perceiving and representing what is reachable for self and for others in 3- to 5-year-old children

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Three, 4- and 5-year-old children were asked to judge the distance at which an object was reachable. In one set of

conditions, children had to judge whether the object was reachable for themselves, and in another whether it was reachable for the experimenter. The object consisted in a plastic apple that could move along a bench. The apple was moved by the experimenter who had access to a system of pulleys from underneath the bench. In all conditions, the child was instructed to judge whether s/he, or the experimenter, could touch the stem of the apple with the extended right hand's index finger. The child was restricted to a perceptual judgement, no actual reach being performed by either the child or the experimenter. Each judgement was recorded in centimeters based on the reading of a measuring tape glued along the side of the apparatus. After testing, the actual reachability of the child in the various conditions was measured on the apparatus, together with his/her arm length and overall physical height.

In one condition, the child judged reachability for self or the experimenter while the apple was presented at shoulders' height in the horizontal plane. In this horizontal condition, the child sat across from the experimenter, with the apple moving back and forth between them, by 1 cm steps and until the child judged the limit of its reachability.

In another condition, the experimenter or the child was underneath the apparatus positioned vertically above their head. When the experimenter's reachability was judged in this vertical condition, the child viewed the experimenter from the side, 2 meters away. In the vertical condition, the child provided reachability judgements when told that either s/he or the experimenter could reach with feet flat on the ground, or while standing on tiptoe. The instruction called for "imagination" as it was purely verbal, no actual feet extension being performed either by the child or the experimenter.

In short, each child provided two reachability judgements for self and for others (the experimenter) in 3 conditions: 1) Horizontal, 2) Vertical while standing with feet flat on the ground, 3) Vertical while standing on tiptoe (instruction of maximum extension).

Order of conditions and type of presentation (ascending or descending) were counterbalanced over children of each age group.

In general, results indicate that from 3 years of age, children differentiate between the limits of their own prehensile space and those of an adult. In all conditions they systematically and significantly attribute more reachability to the adult experimenter. Furthermore, in the vertical condition, they modify adequately their judgements by extending the limits of reachability when told that either themselves, or the experimenter, could stand on tiptoe. When comparing children's judgments with the actual limits of their reachability as measured after the test, results indicate that their judgements of reachability for self is body scaled. Nevertheless, at all ages they tend to overestimate their reachability in the horizontal condition. By contrast, they are remarkably accurate in the vertical condition when judging reachability for self. These results suggest that children take into consideration in their reachability judgments the relative flexibility (stretchability) afforded by the postural condition they are placed in. When judging reachability for the experimenter, they tend in general to underestimate his prehensile space, this underestimate being particularly marked (30%) in the horizontal condition for the 4- and 5-year-olds. Three-year-olds show less underestimation of reachability for the experimenter in the horizontal condition. This effect of age might be an expression of the fact that judging with accuracy affordances for others is more relevant for younger children who rely heavily on others' expertise to perform action.

This research has been replicated with a group of 24 adults who demonstrated a performance identical to the group of 4- and 5-year-old children.

Further experiments currently are under way, testing the hypothesis that when judging reachability for self and for others, both children and adults use perceptual information that pertain to the effort (energy expenditure) the reaching act would entail, taking into consideration constraints on the degrees of behavioral freedom imposed by particular postural conditions.

Size Perception in Events

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The textbook solution to the problem of size perception is to use the image size of an object and information about it's distance to derive the actual object size. This requires an ability to determine absolute distance, but most hypothesized sources of distance information specify only relative distance. Size-distance invariance theory confounds the problems of size and distance perception. Given the difficulty of the distance problem, seeking an independent solution to the problem of size perception might be advisable.

Functional morphologists and scale engineers have discovered that the shape of objects change to preserve function over changes in scale (Baker, Westine & Dodge, 1973; Calder, 1984; Emori & Schuring, 1977; Hildebrand,

Bramble, Liem & Wake, 1985; Thompson, 1961). Scale specific changes in form might provide a source of information about size that is independent of distance. Bingham (submitted) has shown that observers are able to discriminate subtle variations in tree form and to use the information to judge the heights of trees. The variations in form were determined by two physically constrained scaling relations. Both of these studies involved geometric form found in relatively static situations. Consideration of form variations in the context of events leads us to forms of motion described via kinematics.

Bingham (1987a; b; 1991) has proposed that kinematic forms may provide visual information about both event identity and scale. In particular, Bingham (1991) suggested that forms in an optical phase space (optical positions vs. optical velocities) might provide visual information enabling observers to identify events. The problem is that spatial metrics are lost in the mapping from event kinematics to optical flows. For example, reference to optical velocities in terms of meters per second is meaningless. Further, the sensory apparatus exhibits strongly nonlinear characteristics in the detection of optical velocities. Ultimately, any scheme for the recovery of metric event velocities is bound to be unrealistic.

Nevertheless, experimental evidence shows that observers are able to recognize particular types of events from apprehension of forms of motion. Accordingly, Bingham has argued that metric scaled information cannot be necessary and that ordinal scaling of velocity along continuous extents of optical phase trajectories should be sufficient to develop a taxonomy of qualitative properties used in event recognition. In fact, a level of scaling somewhere in the neighborhood of interval scaling is most likely.

Watson, Banks, von Hofsten, and Royden (submitted) have proposed that visual perception of absolute size and distance might be based on the effects of gravity in constraining event motions and the resulting optical flows. They argue that their analysis is superior to earlier analyses by Chapman (1968) because theirs avoids a dependence on detection of optical accelerations. While the ability to detect optical velocity is well established, the ability to detect optical accelerations is uncertain (Regan,Kaufman, & Lincoln, 1986; Rosenbaum, 1975; Runeson, 1975; Schmerler, 1976; Todd, 1981; see the discussion in Bingham, 1991). In the Watson et al. analysis, distance is specified by a relation requiring detection of optical position, vertical velocity, the location of the focus of expansion, and time. Watson et al. avoid measures of optical accelerations by requiring metric information about both optical velocity at an instant and the time interval from the beginning of fall to the instant when velocity is measured. Both of these measures, however, are problematic. Accuracy in determining metric amounts of time is uncertain. Sufficient accuracy in this case is unlikely. Furthermore, measurement errors in detecting times and velocities would compound (Runeson, 1977). Most problematic, however, is the requirement for detection of metric valued velocities. As discussed above, this is inappropriate. Nevertheless, we should pursue the notion that gravity scales forms of motion in events in a way that can be used by the visual system to determine event scale.

An alternative approach is to expand the analysis from a determination of momentary metric values to spatio-temporally extended qualitative properties of optical trajectories.[1] Similarity methods are appropriate for a determination of the role of gravity in the mapping of trajectory forms into optical phase space. Before describing such an analysis , we describe an investigation as to whether observers can determine object size from motions. The only existing evidence that this might be possible is that produced by Johansson & Jansson (1967) in an unpublished study in which they asked observers to adjust a variable speed film projector.

We created several different event displays in which only the motions might enable observers to judge object size. All other types of information about distance or size were eliminated. All geometric extents, including the size of the object and its height above the ground, were held constant in the displays by increasing simulated viewing distance in proportion to increases in actual object size. If the optical phase space trajectories did not provide information about actual size then observers should not have been able to judge the sizes of the objects.

Simulations of planar events were generated using their dynamics. Gravity, friction, elasticity, and mass density were all held constant across changes in event scale. The average frame rate across all of the events was 20 frames per second. Actual frame rates varied from 12 to 30 frames a second depending on the complexity of the displays.

Four types of events were used. A ball free falling and bouncing. A ball rolling down an inclined plane. A ball on the end of a string, acting as a pendulum, swinging downward, hitting and knocking over a block. Finally, a stack of four blocks with a ball on top all falling over and coming to rest on a ground surface. Each event was simulated at 5 different scales. In all displays the diameter of the ball was 1 cm on the screen. The simulated actual diameters of the balls ranged from 2.5 cm to 240 cm.

To control for the possibility that observers might use

event duration or peak velocity to produce judgments of object size, we manipulated these properties in the pendulum and inclined plane events independent of changes in size. Three levels of event duration (and peak velocity) were created in each of the five sizes of the two events by changing the incline of the surface and the length of the pendulum. If event durations or peak velocities were being used, we expected events of identical sizes but different event durations or peak velocities to be judged differently.

Before making judgments the observers were given a demonstration to ensure that they understood the situation being modeled. The demonstration involved two rubber playground balls of differing sizes. First, observers were shown how covariation of object size and distance can produce the same image size. The large ball was held approximately 6 feet from the observer while they adjusted the distance of the smaller ball so that it just occluded the larger ball. Second, observers witnessed examples of free fall events where the distances of fall were scaled to the size of the ball (that is, the larger ball was dropped from a greater height).

After this, observers sat facing a computer terminal and were asked to judge the actual diameter of the ball in each event display. They were allowed to view a display as many times as they felt necessary to make their judgment. The judgments were written in inches. Observers judged all 5 sizes of each event in a block of random ordered trials. Each of the 8 events were judged three times in different random ordered blocks. Preceding each of the first set of blocks, observers were shown a standard for that event. They were told the size of the ball in the standard event. The standard corresponded to the second largest size. During the latter two trials the standard was only shown if the observer requested it.

Mean judgments for each event increased monotonically across object sizes. Observers regularly overestimated the smaller sizes and underestimated the larger sizes resulting in a curved pattern of judgments crossing the line of accurate judgments near the value of the standard.

The manipulation of event duration for the inclined plane and pendulum events revealed that judgments of size were independent of event durations or peak velocities.[2] Variations in the duration of an event within a size level (eg. the three different steepnesses of slopes for a certain size object) did not prevent observers from accurately grouping objects of the same sizes. Objects of equal size were judged similar despite different event durations across the two different types of events as well within a type of event. Because peak velocity covaried with event duration, we concluded that event duration and peak velocity were not used to judge object size.

What qualitative properties of event trajectories might observers have used to judge event scale? We examined the optical phase portraits for all of the events and found a form common to all of the trajectories. All of the trajectories contain segments that were parabolic. In the free fall and bounce, inclined plane, and pendulum events the trajectories were entirely parabolic or nearly so. Because of repeated collisions in the falling stack, only portions of the trajectories were parabolic. The parabolic forms reflect gravitation and (constrained) free fall.

We performed a similarity analysis focusing on free fall.[3] The relevant scale transformation is the mapping into optics, performed by dividing all quantities by the viewing distance. By setting the optical height of fall to 1 (that is, the initial condition in the display), we can perform this transformation by dividing by the actual initial height. The question in performing the similarity analysis is whether, after the transformation has been performed on the equation, the original form of the equation can be recovered in the scale transformed variables (Szcs, 1980). If so, then the scale transformation is "benevolent", meaning that the trajectory forms are preserved. If not, then a distortion of the trajectory forms will result directly from the scale transformation. An accessory factor may be isolated which represents the scale specific form of the distortion. Using the equation which describes trajectories in phase space for the free fall event and divided by the actual initial height of the ball, we showed that the mapping from event kinematics to optic flows yields a distortion, scaling the trajectories by the reciprocal of the initial height to the square root. The square root in the scaling factor accounted for the curvature of the mean judgments for all of the events. The scaling factor also described the decreasing resolution exhibited in judgments as the object size became larger.

Footnotes

1. Detecting the form of trajectories in optical phase space does not require the detection of optical accelerations. Acceleration can be derived from the slope of a trajectory in phase space, but the rate of change of velocity with respect to position is not the same as acceleration. See Bingham (1991) for discussion.

2. Event Duration was measured as the time from the initiation of motion to the termination of the display. In the case of the ball rolling down an inclined plane, this

included the ball's rolling off of the incline. For the falling stack, the display ended when motion ceased. For the cyclic events (free fall and bounce and pendulum), we terminated the display after two full cycles. Thus, event duration was proportional to event periods, especially for the pendulum and inclined plane events. Event durations were also proportional to peak velocities in a given type of event.

3. The analysis generalizes directly to the inclined plane and pendulum events.

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NEWS AND REQUEST

Kim Vicente (soon to move to the University of Toronto) received an award for the best technical paper published in the *Human Factors Society Bulletin* for 1990. The paper was titled "A few implications of an Ecological approach to human factors."

It is encouraging, I think, that a statement with an ecological slant has been so well received in human factors.

-- Gavan Lintern University of Illinois, Aviation Research Laboratory #1 Airport Road, Savoy, Illinois.

Announcement: Pedagogy made visible

Ecological psychology has produced many important experimental effects, displays, and demonstrations. These are often difficult to describe but are easy as pie to see. Optic flow, looming, the visual cliff, rhythmic movement, and so on can be nearly impenetrable for students when described in words and numbers, yet lead to immediate "a-ha" experiences when shown on videotape in the classroom. The existing films, made by the Gibsons, are in bad condition, cover very few topics, and, without supplement by newer material, convey an antiquated perspective on the ecological approach. Moreover, today's MTV-bred students have limited tolerance for silent black & white films from the 50s. The undersigned have acquired the resources to put together a 60-90 minute "Ecological Demonstration Video" for classroom use, to be produced in conjunction with the Radio, TV, and Film Department at the University of Arkansas at Little Rock. If things work as planned we will be able to sell copies of the tape for as little as $15 or $20. We hope to premier the final product at the 1993 Event Conference in Vancouver (no promises!).

We hereby solicit suggestions from the 'ecological community for experiments, effects, or demonstrations that should be included in the tape. It is not necessary that you be the originator or "owner" of an effect in order for you to suggest it. At present we are looking only for ideas. Please send ideas via e- or a-mail to one of the undersigned.

We will select effects that seem both important and visually salient. We will then contact "owners" or other appropriate persons to ask them to contribute to the tape. The key to the project is that each contributor will generate their own high quality, finished segment of videotape. This will allow us to produce a uniform product and to do so without extensive editing of individual segments. We will assemble the contributions and provide introductory and narrative material, along with some studio gimcrackery.

Please send your suggestions to either of the following

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